Prifysgol **Wrecsam**
Wrexham University

Module specification

When printed this becomes an uncontrolled document. Please access the Module Directory for the most up to date version by clicking on the following link: Module directory

Module Code	ENG4AH
Module Title	Engineering Mathematics
Level	4
Credit value	20
Faculty	FACE
HECoS Code	100403
Cost Code	GAME
Pre-requisite module	None

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Mechatronics Engineering	Core

Breakdown of module hours

Learning and teaching hours	60 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	0 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**0** hrs
Placement hours	0 hrs
Guided independent study hours	140 hrs
Module duration (Total hours)	200 hrs

Module aims

To provide a foundation of mathematical knowledge covering a wide range of basic topics and calculus.

To develop an analytical approach to derivation of mathematical functions and expressions.

To develop the application of mathematical principles in the solution of engineering problems, including by means of computer modelling software.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Use algebraic and trigonometric processes to derive and manipulate functions and equations, including scientific notation and significant figures. Plot graphs, including non-linear functions, and calculate their slopes and intercepts.
2	Select and apply appropriate mathematical techniques to the solution of problems.
3	Apply basic statistical analysis.
4	Use differentiation and integration processes including second order differential equations.
5	Use partial differentiation for analysing functions of two variables.
6	Use mathematical modelling software to apply mathematical techniques in solving engineering problems.

Assessment

Indicative Assessment Tasks:
This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1: A 2-hour exam covering outcomes 1, 2, and 3. It is an unseen time-constrained.

Assessment 2: A 2-hour exam covering outcomes 4, 5, and 6. It is an unseen time-constrained one.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1, 2, 3	Examination	2 hrs	50%	
2	4, 5, 6	Examination	2 hrs	50%	

Derogations

None.

Learning and Teaching Strategies

The calculus component of the module will be presented to the students through a specified series of lectures, supported by problem-solving practice carried out in interactive tutorials. These tutorials will be supported by practice using computer software both in tutorial time and by directed study outside the classroom.

Welsh Elements

Programme is delivered in English and Chinese, however students can submit assessments in Welsh.

Indicative Syllabus Outline

Number systems: Numbers, place value, scientific notation and significant figures. Fractions. Use of calculator;

Algebra: Rules and manipulation of algebraic expressions. Language of derivation (and symbols). Solutions of equations. Introduction to polynomials.

Functions and Graphs: Define function. Plotting and interpreting graphs. Slopes, intersection.

Trigonometric functions.

Powers: indices, exponentials and logarithms.

Graphs: Linear graphs from non-linear functions.

Vector algebra: Addition and subtraction, unit vectors, scalar and vector products.

Statistics: Define and calculate numeric measures of average and spread.

Complex numbers: Different forms and arithmetic, DeMoivre's theorem, powers and roots, relation between trig and hyperbolic functions.

Differentiation: Products, quotients, implicit and parametric differentiation, use of logs for complex products and quotients, partial differentiation, total differentials, and partial fractions, applications.

Analyse Functions of Several Variables: Minimum, maximum and saddle points of functions of 2 independent variables. Change of variables, inverse functions and Jacobians.

Integration: Methods of substitution, partial fractions and by parts. Definite and indefinite integrals, applications.

First Order Differential equations: Linear first order differential equations; separation of variables, use of integrating factor. Second order with zero input - three types of solutions.

Second Order Differential Equations with Constant Coefficients: Method of undetermined coefficients for finding particular integrals. Transient and steady state solutions. Applications to damped vibrations and resonance. Introduction to finite difference methods for ordinary differential equations.

Applications: Contextualising the application of the topics considered in this module to make them relevant to the chosen technology specialism.

Software: Mathematical modelling software to support other elements of this module, emphasising potential as an analytical tool.

Indicative Bibliography

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads:

Glyn, J. (2015) Modern Engineering Mathematics, 5th Edn, Prentice-Hall.

Other indicative reading:

Bird, J. (2010) Engineering Mathematics, 6th Edn, Newnes.

Singh, K. (2011) Engineering Mathematics through Applications, 2nd Edn, Palgrave Macmillan.

Stroud, K. (2007) Engineering Mathematics, 6th Edn., Palgrave Macmillan.

Administrative Information

For office use only	
Initial approval date	24/09/2020
With effect from date	24/09/2020
Date and details of revision	23/03/2022 administrative update to include exam duration 22/07/2025 revalidated, updated template, derogation removed
Version number	3